SECTION 4.0: ENVIRONMENTAL CONSEQUENCES

This section describes the environmental and socioeconomic consequences of implementing the No Action alternative and Alternative Actions 1, 2, and 3. NEPA requires mitigation measures be identified and implemented if significant adverse environmental effects are identified. The Council on Environmental Quality defines mitigation as avoidance, minimization, and reduction of impacts and compensation for unavoidable impacts (40 CFR 1508.20). Mitigation is not required for beneficial or minor adverse impacts.

4.1 GEOLOGY

4.1.1 Proposed Action (Alternative 1)

No effects would be expected to geology and soils from reissuance of the NPDES general permit under Alternative 1. Produced water and other discharges to surface waters occurring under the new permit from existing facilities would take place in waters greater than 5 meters in depth. Produced water discharge from new source facilities would not be permitted, although discharge of other sources including sanitary and domestic wastewater, deck drainage, and other miscellaneous discharges such as cooling water and those associated with the use of synthetic-based drilling fluids from exploration activities would be allowed in waters greater than 10 meters in depth. In addition, the prohibition of discharge within 1,000 meters of coastal marshes, river deltas, and other areas under the existing permit would be expanded to 4,000 meters under the new permit (EPA 2005). These depths and distances allow greater dispersal of produced water than shallower and near-shore areas, and therefore would not be expected to have a measurable effect on seafloor sediments or shoreline soils.

4.1.2 Alternative 2

No effects would be expected to geology and soils from reissuance of the NPDES general permit under Alternative 2. All produced water from both existing and new source facilities would be reinjected into subsurface geological formations; therefore, no discharge to surface waters would occur. Effects from other discharges on seafloor sediments or shoreline soils would be similar to those under Alternative 1.

4.1.3 Alternative 3

No effects would be expected. Produced water discharges from new source facilities would be permitted under Alternative 3, but only in waters greater than 10 meters in depth. Effects would be similar to those under Alternative 1.

4.1.4 No Action Alternative (Alternative 4)

No effects would be expected. Produced water discharges to surface waters occurring under continuation of the existing NPDES permit would not affect geology or soils. No new source

facilities would be authorized; therefore, no increase in produced water from additional facilities would occur.

4.2 CLIMATE AND METEOROLOGY

4.2.1 Proposed Action (Alternative 1)

No effect on climate or meteorology (air temperature, precipitation, or winds) would occur. No effects on air quality would be expected. The ambient concentrations of regulated air pollutants in the project's vicinity are well below the applicable NAAQS, and the air quality is generally considered good. The largest sources of emissions are in the industrial areas and population centers of Kenai (Nikiski) and Anchorage (SAIC 2002). Air-quality modeling was done for the 2003 Cook Inlet multiple-sale proposal. Results of the modeling showed that the highest pollutant concentrations would be from nitrogen dioxide and that the concentrations would be well within the PSD limits and NAAQS, even for the wilderness portion of the Tuxedni National Wildlife Refuge subject to the strict Class I PSD limits.

4.2.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.2.1 above.

4.2.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.2.1 above.

4.2.4 No Action Alternative (Alternative 4)

No effects would occur. Under the no action alternative, no new sources would be permitted. Therefore, air emissions from existing sources would be expected to continue at the same level, but no new sources of air emissions from exploration, production, or development of facilities would occur. The Cook Inlet area is in attainment with NAAQS and is within PSD limits.

4.3 OCEANOGRAPHY

4.3.1 Proposed Action (Alternative 1)

No effects would occur. Implementation of the proposed NPDES permit under Alternative 1 would not affect bathymetry, circulation, tides, upwelling, downwelling, fronts, convergences, sea ice, or water temperature in Cook Inlet or the Shelikof Strait.

4.3.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.3.1 above.

4.3.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.3.1 above.

4.3.4 No Action Alternative (Alternative 4)

No effects would occur. The no action alternative would not affect bathymetry, circulation, tides, upwelling, downwelling, fronts, convergences, sea ice, or water temperature in Cook Inlet or the Shelikof Strait.

4.4 MARINE WATER QUALITY

4.4.1 Proposed Action (Alternative 1)

Long-term minor adverse effects would be expected. Under Alternative 1, produced waters could be discharged from existing sources but could not be discharged from new sources. New sources would have to reinject their produced waters or dispose of it by other means. The proposed action would maintain many of the provisions for existing sources that are in the current permit. In addition, water quality-based limits under the expired permit were reexamined, and new whole effluent toxicity- and technology-based limitations are proposed to be added for discharges to which treatment chemicals, such as biocides and corrosion inhibitors, are added; chemically treated sea water discharges can include water flood wastewater, cooling water, boiler blowdown, and desalination unit wastewater.

On the basis of the Cook Inlet Discharge Monitoring Study, produced water discharges from existing sources are toxic to moderately toxic. The amount of total organic carbon in the sediments, where contaminants could accumulate, is low and indicates an environment that generally is uncontaminated (MMS 2003). The water quality of lower Cook Inlet generally is good. The proposed NDPES general permit would contain the limitations and conditions that are necessary to attain state water quality standards and federal criteria, maintain the water quality of Cook Inlet, and prevent unreasonable degradation of the marine environment.

4.4.2 Alternative 2

Long-term minor beneficial effects on marine water quality would be expected. Under Alternative 2, existing sources, along with new sources, would not be allowed to discharge produced water. Produced waters would have to be reinjected downhole during development and production. Zero discharge of produced waters through reinjection would reduce or eliminate the release of man-made contaminants from petroleum activities and any associated sedimentation and turbidity in Cook Inlet. Such contaminants include chemicals (flocculants, oxygen scavengers, biocides, cleansers, and scale and corrosion inhibitors) that are added to fluids that are part of the petroleum exploration and production activity.

4.4.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.4.1 above.

4.4.4 No Action Alternative (Alternative 4)

No effects would be expected. The existing sources would continue to operate under the limitations of the current NPDES permit, which is designed to maintain the water quality of Cook Inlet in compliance with state water quality standards and federal criteria. No new sources would be permitted.

4.5 BIOLOGICAL RESOURCES

4.5.1 Proposed Action (Alternative 1)

Long-term minor adverse effects on biological resources would be expected from the implementation of the proposed NPDES permit under Alternative 1. Most species that inhabit Cook Inlet waters are not likely to be present in the waters close to the permitted activities or are unlikely to be affected by discharges from oil and gas exploration, production, and development facilities.

Permitted discharges from new sources in the area covered by MMS lease sales 191 and 199 would include sanitary wastewater, domestic wastewater, deck drainage, miscellaneous discharges such as cooling water and boiler blowdown, and those associated with the use of synthetic-based drilling fluids from exploration facilities. EPA has stated that the impacts of the use of synthetic-based drilling fluids are believed to be of limited duration and are less harmful to the environment than the impacts associated with oil-based drilling fluids (EPAI 2000). Effects on benthic areas within a limited zone near drilling points (within a few hundred meters) generally have been found to be of limited duration, and the sea floor recovers within 1–2 years. No effects on biological resources would be attributable to produced water discharges under the proposed action because the preferred alternative does not permit them from new sources. The proposed general permit establishes water quality-based limitations and monitoring requirements necessary to ensure that the authorized discharges comply with the state of Alaska water quality standards as well as federal ocean discharge criteria.

Water quality-based limits under the expired permit have been reexamined based on current dispersion modeling practices and proposed mixing zones for existing facilities range from 36 to 2,685 meters. Mixing zones for whole effluent toxicity, chronic metals, and acute metals have the ranges 73–780 m, 4–262 m, and 1–202 m, respectively.

4.5.2 Alternative 2

Long-term minor adverse and beneficial effects could occur. Effects would be largely the same as those stated for Alternative 1 in Section 4.5.1 above. Some improvement in water quality could result from the discontinuation of produced water discharges from existing sources in leased areas, though the water quality improvements would be minor and would be unlikely to be significantly beneficial to biological resources because most species that inhabit Cook Inlet waters are not likely to be present in the waters close to the permitted activities or are unlikely to be affected by discharges from oil and gas facilities.

4.5.3 Alternative 3

Long-term minor adverse effects on biological resources would be expected. Effects would be largely the same as those stated for Alternative 1 in Section 4.5.1 above. The permitting of produced water discharges from new sources would not likely have an effect because it is not expected that production from new sources would occur during the life of the proposed general permit. If produced water discharges were to originate from new sources during the life of the permit, the effects on biological resources would be expected to be minor because all discharges would be required to comply with the state of Alaska water quality standards as well as federal ocean discharge criteria. Additionally, most species that inhabit Cook Inlet waters are not likely to be present in the waters close to the permitted activities or are unlikely to be affected by discharges from oil and gas exploration, production, and development facilities.

4.5.4 No Action Alternative (Alternative 4)

No effects would be expected. Under the no action alternative, the area of coverage of the reissued NPDES general permit would remain the same. Most species that inhabit Cook Inlet waters are not likely to be present in the waters close to the permitted activities or are unlikely to be affected by discharges from oil and gas exploration, production, and development facilities. All provisions in the proposed NPDES general permit would be identical to the existing permit. There wold be no change to either adversely or beneficially affect biological resources.

4.6 THREATENED AND ENDANGERED SPECIES

4.6.1 Proposed Action (Alternative 1)

Long-term minor adverse effects on threatened and endangered species would be expected from discharge from new sources with the implementation of the draft NPDES permit under Alternative 1. The effects discussed under 4.5.1 above apply equally to threatened and endangered species, i.e., the threatened and endangered species that occur in Cook Inlet are not likely to inhabit waters close to the permitted activities and are therefore unlikely to be affected by discharges from oil and gas facilities. Furthermore, with respect to water quality, the Final Environmental Impact Statement (FEIS) for the Cook Inlet Planning Area sales concluded that the "[p]otential effects from either or both sales would not cause any overall measurable degradation to Cook Inlet water quality" (MMS 2003). The FEIS concluded that any effects to threatened and endangered species would likely be due to "...noise and other disturbance caused by exploration, development, and production activities and disturbance from aircraft and vessels. For example, in specific areas, particularly near the Barren Islands, these disturbances could affect behavior of Steller sea lions and its critical habitat (e.g., haulouts); cause local, short-term effects on the feeding of humpback whales in the Kennedy and Stevenson entrances; and locally affect some Cook Inlet beluga whales" (MMS 2003). The potential water quality effects of the NPDES permitting alternatives, however, are the primary concern in this environmental assessment.

4.6.2 Alternative 2

Long-term minor adverse and beneficial effects could occur. Effects would be largely the same as those stated for Alternative 2 in Section 4.5.2 and Alternative 1 in Section 4.6.1. Some improvement in water quality could result from the discontinuation of produced water discharges from existing sources in leased areas, though it would be unlikely to be significantly beneficial to threatened and endangered species because the threatened and endangered species that occur in Cook Inlet are not likely to inhabit waters close to the permitted activities and are therefore unlikely to be affected by discharges from oil and gas facilities.

4.6.3 Alternative 3

Long-term minor adverse effects would be expected. Effects would be largely the same as those stated for Alternative 3 in Section 4.5.3 and Alternative 1 in Section 4.6.1, i.e., the threatened and endangered species that occur in Cook Inlet are not likely to inhabit waters close to the permitted activities and are therefore unlikely to be affected by discharges from oil and gas facilities. It is not expected that production would originate from new sources during the life of the proposed general permit, and if produced water discharges were to occur from new sources, the effects on threatened and endangered species would be expected to be minor.

4.6.4 No Action Alternative (Alternative 4)

No effects would be expected. Under the no action alternative, the area of coverage of the reissued NPDES general permit would remain the same. The threatened and endangered species that occur in Cook Inlet are not likely to inhabit waters close to the permitted activities and are therefore unlikely to be affected by discharges from oil and gas facilities. All provisions in the proposed general permit would be identical to the expired general permit.

4.7 SOCIOECONOMIC CONDITIONS

4.7.1 Proposed Action (Alternative 1)

Long-term minor beneficial economic effects would be expected. Under Alternative 1, production-related discharges from existing oil and gas wellheads in Cook Inlet would be permitted to continue. In addition, new sources would be authorized. A 2003 study determined that development and production of new lease sales 191 and 199 would generate economic activity primarily in property taxes, employment, and personal income. These economic effects would be in the Kenai Peninsula Borough. The increases in property taxes for the Kenai Peninsula Borough would average about 6 percent above the 2000 level of Borough revenues, estimated at about $2.7 million per year for 15 years during production (MMS 2003).

Maintaining water quality and biological resources is integral to the region's fishing, recreation, and tourism industries, as well as subsistence harvesting. Degradation of resources that would affect, for example, fish populations, would adversely effect these industries through a decline in harvest, which in turn could affect sales, income, and employment. According to TEK interviewees, traditional harvest areas and subsistence practices have changed in recent years

(SRB&A 2005). However, the water quality and biological resources are not expected to be significantly affected by implementation of the proposed NPDES general permit (see Sections 4.4 and 4.5) because the permit is designed to protect these resources from degradation. Therefore, no loss to these industries would be anticipated.

4.7.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.7.1 above.

4.7.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.7.1 above.

4.7.4 No Action Alternative (Alternative 4)

No effects would occur. Under the no action alternative, existing sources would continue to operate per the requirements of the current permit, but no new sources would be authorized. No change to the oil and gas industry, fishing and recreation and tourism industries, or subsistence harvesting, would occur, although according to TEK interviewees, traditional harvest areas and subsistence practices have changed in recent years (SRB&A, 2005).

4.8 LAND AND SHORELINE USE AND MANAGEMENT

4.8.1 Proposed Action (Alternative 1)

No effects from the proposed action on land and shoreline use and management would be expected. Although water dependency is a prime criterion for development along the shoreline, produced water discharge at offshore drilling platforms would not be expected to affect onshore land uses.

Both coastal districts adjacent to the lease sale area (Kodiak Island Borough and Kenai Peninsula Borough) have approved Coastal Zone Management Programs. Pursuant to 40 CFR Part 122.49(d), the requirements of Alaska's Coastal Zone Management Plan must be satisfied prior to issuance of the new NPDES permit. EPA has determined that the activities that would be authorized under the new NPDES permit would be consistent with the Alaska Coastal Zone Management Plan. EPA will seek concurrence with its determination prior to issuance of the permit.

4.8.2 Alternative 2

Similar to those under Alternative 1, no effects would be expected on land and shoreline use and management from reissuance of the NPDES general permit under Alternative 2.

4.8.3 Alternative 3

Similar to those under Alternative 1, no effects would be expected on land and shoreline use and management from reissuance of the NPDES general permit under Alternative 3.

4.8.4 No Action Alternative (Alternative 4)

No effects would be expected. Produced water discharges to surface waters occurring under continuation of the existing NPDES general permit would not affect land and shoreline use or management.

4.9 TRANSPORTATION AND INFRASTRUCTURE

4.9.1 Proposed Action (Alternative 1)

No effects would be expected. Implementation of the NPDES general permit as proposed under Alternative 1 would not alter or change existing air, surface, or marine transportation use or traffic patterns associated with the existing sources or the new lease sales of 191 and 199.

4.9.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.9.1 above.

4.9.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.9.1 above.

4.9.4 No Action Alternative (Alternative 4)

No effects would be expected. Under the no action alternative, the area of coverage of the reissued NPDES general permit would remain the same. All provisions in the new NPDES general permit would be identical to the expired general permit. No changes in air, surface, or marine transportation use or traffic patterns associated with the existing sources would be anticipated.

4.10 RECREATION, TOURISM, AND VISUAL RESOURCES

4.10.1 Proposed Action (Alternative 1)

No effects would be expected from existing or new sources. Recreation, tourism, and visual resources could be affected by produced water if discharges increase contaminants or turbidity to a level where the water is no longer suitable for recreational use. The proposed general permit establishes water quality-based limitations and monitoring requirements necessary to ensure that the authorized discharges comply with the state of Alaska water quality standards and federal ocean discharge criteria. Implementation of the proposed permit under Alternative 1 establishes criteria to prevent unreasonable degradation of the marine environment so no effects on recreation, tourism, or visual resources would be expected to occur.

4.10.2 Alternative 2

No effects would be expected. Under Alternative 2, no produced water discharges from new or existing sources would be permitted, therefore no effects on recreation, tourism, or visual resources would be expected to occur.

4.10.3 Alternative 3

No effects would be expected from existing or new sources. Under Alternative 3, produced water discharges would be permitted from both existing and new sources. However, as with Alternative 1, the proposed general permit establishes water quality-based limitations and monitoring requirements necessary to ensure that the authorized discharges comply with the state of Alaska water quality standards as well as federal ocean discharge criteria. The implementation of the proposed general permit under Alternative 3 would establish criteria to prevent unreasonable degradation of the marine environment so no effects on recreation, tourism, or visual resources would be expected to occur.

4.10.4 No Action Alternative (Alternative 4)

No effects would be expected. Under the no action alternative, no new sources would be authorized. Produced water discharges from existing facilities would continue to be regulated and monitored to maintain compliance with Alaska water quality standards and to prevent unreasonable degradation of the marine environment in conformance with federal ocean discharge criteria. No effects on recreation, tourism, or visual resources would be expected to occur.

4.11 CULTURAL, HISTORIC, AND ARCHAEOLOGICAL RESOURCES

4.11.1 Proposed Action (Alternative 1)

No effects would be expected. Effects to archaeological resources result primarily from physical disturbance of archaeological resource sites. Implementation of the proposed NPDES general permit would not result in the disturbance of any archaeological resources sites. In addition, federal, state, and local laws and ordinances, including the National Historic Preservation Act, the Archaeological Resources Protection Act, and the Alaska Historic Preservation Act, protect known sites and also areas where presently unidentified archaeological resources may occur. Existing regulations require archaeological surveys to be conducted prior to permitting any activity that might disturb a significant archaeological site. Therefore, effects on most archaeological resources will be located, evaluated, and mitigated prior to any onshore construction.

New data related to the human history and prehistory of Alaska likely will be produced from compliance-related archaeological projects associated with the proposed permit. The Minerals Management Service (MMS) prepared an archaeological analysis for the 191 and 199 lease sales for Cook Inlet (MMS 2003). A separate analysis was completed for historic resources (Shipwreck Update Analysis). The analysis was based on a review of all available information and was intended to identify lease blocks within the lease-sale area that might contain

archaeological resources. These blocks, if leased, will require an archaeological report to be prepared prior to the MMS' approval of any lease activities (MMS 2003).

If, despite required archaeological analyses and surveys, a significant archaeological resource were disturbed by a routine activity, the magnitude of the impact would depend on the significance and uniqueness of the information lost. However, due to existing laws and regulations that serve to identify significant archaeological resources prior to disturbance, it is unlikely that such an impact would occur as a result of implementation of the proposed action.

Many of the TEK interviewees indicated that due to the social and cultural importance of subsistence harvesting to tribal members, the health of subsistence resources be considered by agencies and industry when making decisions such as the new platform discharge stipulations (SRB&A 2005). Some interviewees explained that they place importance on the ability to gather clean subsistence foods from the land and sea because such practices allow them to maintain a healthy culture and life (SRB&A 2005).

Concern about cumulative effects related to potential oil spills are generally based on TEK interviewee's experiences with the 1989 Exxon Valdez oil spill and a desire never to go through that again. TEK interviewees expressed that this experience leads to concern about a potential spill from the platforms because after the contaminants study everyone became more enlightened to the platforms. Interviewees expressed that this experience has exacerbated concerns over potential environmental and social impacts of oil and gas activities in Upper Cook Inlet, a concern that is linked to a sense that industry is not forthright about the ecological effects of their operations (SRB&A 2005).

In addition to the local environment, some TEK interviewees stated that the *Exxon Valdez* oil spill impacted tribal social structure. One stated "Prior to the oil spill, people harvested subsistence foods with hardly any worries with the exception of red tides. The oil spill did not just affect the ocean—but also the dynamics of the community and how people help and work with each other. My concern is if there is ever another oil spill, and I pray there is not, how much of a problem this will be for the village" (SRB&A 2005).

TEK interviewees asked several questions related to cumulative effects from the platforms, including:

- What are the contents and amount of the discharge?
- How old are the platforms?
- Do older platforms pose a risk?
- What is the relationship between high rates of cancer and the discharge?
- Why is Cook Inlet the only place in the United States that allows this type of discharge?
- What would be a legal challenge to the stipulation from the EPA that the permit can not require zero discharge?

Additionally, because many of the TEK interviewees do not know what platform discharges look like or how much is allowed from each platform, they expressed difficulty in determining direct effects of the discharge. Interviewees emphasized that they lack information about the nature of

platform discharge and, therefore, do not feel adequately informed to answer questions about the relationship between platform discharge and subsistence resources (SRB&A 2005).

4.11.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.11.1 above.

4.11.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.11.1 above.

4.11.4 No Action Alternative (Alternative 4)

No effects would occur. Under the no action alternative, existing sources would continue to operate per the requirements of the expired general permit, but no new sources would be authorized. No physical disturbance of archaeological resource sites would occur from the implementation of the no action alternative, although TEK interviewees indicated that due to the social and cultural importance of subsistence harvesting to tribal members, the health of subsistence resources be considered by agencies and industry when making decisions such as the new platform discharge stipulations (SRB&A 2005).

4.12 ENVIRONMENTAL JUSTICE

4.12.1 Proposed Action (Alternative 1)

During the development of the Cook Inlet NPDES General Permit reissuance, potential EJ communities were considered for the entire watershed area, coinciding with the coverage area for the general permit. Application of EJ principles and guidance for offshore oil and gas resource extraction pose some unique challenges in terms of potential affected communities because of the large potentially affected area.

The Kenai Peninsula Borough and Municipality of Anchorage have been determined to be appropriate reference areas for the potentially affected communities. Census data for 2000, the most recent year available, indicate the Kenai Peninsula Borough and the Municipality of Anchorage both have American Indian and Alaska Native populations of 7.5 and 7.3 percent, respectively. Percentages of the population below the poverty level for Kenai and Anchorage are 10 and 7.3 percent, respectively (see Table 4-1). Based on this information, a total of 10 tribal communities were identified as potential EJ communities in the Cook Inlet basin. These are also communities where EPA has a tribal trust responsibility and where government-to-government consultation has or will occur with respective tribal governments (as requested by the tribal councils). These tribal governments are: Chickaloon Native Village, Native Village of Eklutna, Kenaitze Tribe, Knik Tribe, Native Village of Nanwalek, Ninilchik Village, Native Village of Port Graham, Salamatof Tribal Council, Seldovia Village Tribe, and Native Village of Tyonek. While the tribal trust responsibility and environmental justice are two distinct and separate responsibilities, in these Cook Inlet communities there is a nexus of issues and concerns, especially in regard to the safety of the subsistence foods and potential cultural effects, including continuation of the subsistence way of life.

Table 4-1. Percentages of the Population Below the Poverty Level for Kenai and Anchorage

Race	Kenai Borough	Anchorage Borough	Alaska	US
White	86.2	72.2	69.3	75.1
Black/African American	0.5	5.8	3.5	12.3
American Indian and Alaska Native	7.5	7.3	15.6	0.9
Asian	1.0	5.5	4.0	3.6
Hawaiian/Pacific Islander	0.2	0.9	0.5	0.1
Other Race	0.8	2.2	1.6	5.5
Two or more Races	3.9	6.0	5.4	2.4
White, not of Hispanic/Latino Origin	85.1	69.9	67.6	69.1
Hispanic or Latino	2.2	5.7	4.1	12.5
Below Poverty	10.0	7.3	9.4	12.4

In the course of reissuance of the Cook Inlet NPDES General Permit, EPA held numerous informational meetings to solicit early input from non-governmental organizations, industry and tribal governments into the process and to make the entities aware of opportunities to identify issues and concerns. Additionally, as a component of the Agency's tribal trust responsibilities, EPA has established and continued early and consistent dialog with tribal members and tribal governments through conference calls and face to face meetings conducted between July 2002 and September 2005. Concerns and issues identified through tribal conversations included the potential effects of oil spills and the ongoing discharge of contaminants from the platforms. These issues and concerns are discussed throughout this EA as applicable. EPA also collected Traditional Ecological Knowledge (TEK) from tribal members for inclusion in this EA and use in development of permit conditions. TEK is discussed in Sections 3.13 and 4.13 and incorporated in appropriate sections throughout the document. EJ guidance specifies that EPA should use available means to identify particular natural resources that, if affected by the proposed action, could have a disproportionately high and adverse effect on minority and/or low income communities, in particular natural resources that support subsistence living. EPA believes that the need to collect and evaluate information relative to potential EJ community concerns and ensure meaningful involvement has been largely achieved through the communication and information received from interactions with tribal communities as a component of the Agency's trust responsibilities, which is a higher standard.

In order to address the concerns raised by tribal members through TEK interviews, government-to-government conversations, and comments received on previous agency actions, the draft NPDES permit includes several monitoring and discharge limitation provisions to protect sensitive areas. The permit also requires data collection on contaminants in receiving waters and sediment from all new facilities and large volume dischargers (more than 100,000 gallons per day) that could affect subsistence resources. These efforts address concerns related to subsistence and meet the intent of the EO and agency guidance for EJ through additional data collection and increased community participation in the permitting process.

For a proposed action to result in EJ impacts, there must be significant adverse impacts on human health, socioeconomics or cultural resources and subsequently disproportionately affect minority or low-income populations. No significant adverse impacts have been identified for any of the resources addressed in this EA. Therefore, a finding of no EJ impacts is appropriate. However, there is recognition that there are unique resource characteristics and concerns with the subsistence lifestyle, for both native and non-native communities. These concerns are addressed in the EA.

4.12.2 Alternative 2

Effects would be the same as those stated for Alternative 1 in Section 4.12.1 above.

4.12.3 Alternative 3

Effects would be the same as those stated for Alternative 1 in Section 4.12.1 above.

4.12.4 No Action Alternative (Alternative 4)

Effects would be the same as those stated for Alternative 1 in Section 4.12.1 above.

4.13 CUMULATIVE EFFECTS

Cumulative effects are defined by CEQ at 40 CFR 1508.7 as the "impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Oil and gas exploration and production activities have occurred in the Cook Inlet basin for more than 50 years. In the late 1950s and the 1960s, several commercial oil and gas fields were discovered. Many of the commercial-sized fields discovered during that time are still producing today. Cook Inlet oil production, which peaked at 230 thousand barrels per day in 1970, declined to 27.5 thousand barrels per day by 2003. Cumulative production between 2004 and 2009 is an estimated 42.6 million barrels. Oil production in Cook Inlet is expected to continue to 2016. Cook Inlet natural gas production reached 217 billion cubic feet (bcf) per year in 1984 and peaked at 223 bcf in 1996. Natural gas production has remained relatively stable at an average of 213 bcf per year from 1997 to 2001. In 2003, gas production was at 208 bcf per year, and cumulative production for 2004 through 2009 is an estimated 1,131 bcf. Natural gas production in Cook Inlet is expected to continue beyond 2022 (ADNR DOG 2004).

The cumulative impact analysis considers the past and current lease sale activities; past oil and gas exploration and production; oil and gas discoveries that have a reasonable chance of being developed during the next 15–20 years; and speculative exploration and development of additional undiscovered resources (onshore and offshore) that could occur during the next 15–20 years. Based on a review of the lease sale documents, an estimated 20 new exploration wells are projected to be drilled, resulting in up to 60 new production wells drilled from as many as 7 new platforms.

Cook Inlet is a high-energy environment. Fast tidal currents and tremendous mixing produce rapid dispersion of soluble and particulate pollutants. For example, the turbidity caused by suspended particulate matter in drilling fluids and cuttings discharges is expected to be diluted to levels that are within the range associated with the variability of naturally occurring suspended particulate matter concentrations in Cook Inlet within a distance of between 100 and 200 meters from the discharge point of from oil and gas facilities.

Although the ratio of produced water to oil will continued to increase from existing Cook Inlet production facilities, discharges from these facilities are not anticipated to have cumulative effects based on the modeling conducted for this permit reissuance. Nonvolatile hydrocarbons (oil and grease) in produced waters discharged from existing oil production platforms would be diluted a thousandfold within several hundred meters. At a 1,000:1 dilution, the concentrations of nonvolatile hydrocarbons would reduce from 29 parts per million (PPM) to 29 parts per billion (PPB) within several hundred meters of the platform, and the concentrations of total aromatic hydrocarbons might range from 8 to13 PPM close to the platform and 8 to13 PPB within several hundred meters of the platform. Produced water discharges from new (projected) multiple-well production platforms would likely be injected into underlying formations, but even if discharged, produced water would not be expected to degrade the quality of Cook Inlet water.

In general, the amounts of pollutants in the other discharges from existing and projected facilities are expected to be relatively small (from 4 to 400 or 800 liters per month) and diluted with sea water several hundred to several thousand times before being discharged into the receiving waters. These routine other discharges associated with oil production are not expected to cause any overall degradation of Cook Inlet water quality, therefore, no cumulative effects would be expected under any of the alternatives.

Recreation and commercial uses of the Cook Inlet basin include sport fishing and hunting, fish processing, guides, timber harvesting and restoration, mining and reclamation, agriculture and mariculture, recreation and tourism, and public works projects, along with oil and gas exploration and development. Of these, oil and gas development is the main agent of industrial-related change in the Cook Inlet area. TEK interviewees were aware of the platforms and expressed concern about the effects of platform operations on Cook Inlet waters and resources. While interviewees noted numerous recent declines in health and abundance of subsistence resources, they expressed the view that they did not have enough information about the effects of platform discharge to draw a direct correlation, however, until the effects of platforms discharge proven to be harmless, they would be a concern (SRB&A 2005).

TEK interviewees emphasized the importance of conducting more research to better understand contaminants in the Inlet and the roles of potential sources, including platforms, barges, fishing

vessels, and municipal runoff. They indicated that, on the platforms, research should include a more extensive monitoring program, for marine resources as well as smaller marine plant and animal life. TEK interviewees believe this research should be reported in a clear language that identifies findings in terms of a subsistence diet and believe that the failure to correlate contaminant levels to subsistence consumption levels in layman's language was a shortcoming of the previous EPA study on contaminants in Cook Inlet (SRB&A 2005).

4.14 MITIGATION

EPA has included the following permit conditions as part of the draft NPDES general permit. These permit conditions will serve as mitigation measures to lessen the potential for adverse environmental impacts.

- The proposed NPDES general permit contains water quality-based and technology-based limits and monitoring requirements that are necessary to attain state water quality standards and federal criteria. Permittees must comply with all applicable local, state, and federal codes, statutes, and regulations. The implementation of these limitations and conditions would maintain the water quality of Cook Inlet and prevent unreasonable degradation of the marine environment.

- The proposed NPDES general permit does not authorize discharges of produced water, drilling fluids, and drill cuttings from new source development and production facilities.

- The proposed NPDES general permit increases the setback distances for discharges of drilling fluids and drill cuttings from exploratory facilities from 1,000 meters of sensitive areas to 4,000 meters.

- The proposed NPDES general permit establishes new limits on both the amount of treatment chemicals added, and toxicity, for discharges such as water flood waste water and cooling water.

- The proposed NPDES general permit establishes more stringent limits for total residual chlorine.

- The proposed NPDES general permit requires two new studies to gain a better understanding of the potential impacts of the discharges. Specifically, the proposed permit requires operators of all new facilities installed during the permit's five-year term to conduct baseline monitoring. The proposed permit also includes ambient monitoring requirements for large volume produced water discharges. Operators are required to collect sediment and water column samples to determine the ambient pollutant concentration in the vicinity of the discharges.

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SECTION 5.0: FINDINGS AND CONCLUSIONS

This EA has been prepared to evaluate the potential effects on the natural and human environment from activities associated with reissuing the expired NPDES General Permit No. AKG285000 for oil and gas exploration, development, and production facilities in Cook Inlet, Alaska. The EA has examined this proposed action (also referred to as Alternative 1) to reissue the expired permit. Two alternatives to the proposed action and a no action alternative were also evaluated.

The EA has evaluated potential effects on geology; climate and meteorology; oceanography; marine water quality; biological resources; threatened and endangered species; socioeconomic conditions; land and shoreline use and management; transportation and infrastructure; recreation, tourism, and visual resources; cultural, historical, and archaeological resources; and environmental justice.

5.1 FINDINGS

5.1.1 Consequences of the Proposed Action (Alternative 1)

The evaluation of the proposed action (Alternative 1, reissuance of the NPDES general permit), indicates that the physical and socioeconomic environment of Cook Inlet and the surrounding region are not expected to be significantly affected. The predicted consequences on resource areas are briefly described below.

5.1.1.1 Geology

No effects would be expected.

5.1.1.2 Climate and Meteorology

No effects would be expected.

5.1.1.3 Oceanography

No effects would be expected.

5.1.1.4 Marine Water Quality

Long-term minor adverse effects would be expected. Produced water discharges from existing sources are toxic to moderately toxic. Produced water discharges comprise the overwhelming majority of discharges by volume (relative to other oil and gas platform discharges). The water quality of lower Cook Inlet generally is good. The reissued NDPES permit would contain the limitations and conditions that are necessary to attain state water quality standards and federal

criteria, maintain the water quality of Cook Inlet, and prevent unreasonable degradation of the marine environment.

5.1.1.5 Biological Resources

Long-term minor adverse effects on biological resources would be expected from the implementation of the proposed NPDES permit under Alternative 1. Most species that inhabit Cook Inlet waters are not likely to be present in the waters close to the permitted activities or are unlikely to be affected by discharges from oil and gas exploration, production, and development facilities.

Permitted discharges from new sources in the area covered by MMS lease sales 191 and 199 would include sanitary wastewater, domestic wastewater, deck drainage, miscellaneous discharges such as cooling water and boiler blowdown, and those associated with the use of synthetic-based drilling fluids from exploration facilities. EPA has stated that the impacts of the use of synthetic-based drilling fluids are believed to be of limited duration and are less harmful to the environment than the impacts associated with oil-based drilling fluids. Effects on benthic areas within a limited zone near drilling points (within a few hundred meters) generally have been found to be of limited duration, and the sea floor recovers within 1–2 years. The routine activities associated with exploration in upper Cook Inlet have not had a documented effect on lower trophic-level organisms. It is expected that the routine activities associated with exploration from authorized new sources would be similar and expect no measurable effects on the local populations.

5.1.1.6 Threatened and Endangered Species

Long-term minor adverse effects on threatened and endangered species would be expected from the implementation of the proposed NPDES permit under Alternative 1, i.e., the threatened and endangered species that occur in Cook Inlet are not likely to inhabit waters close to the permitted activities and are therefore unlikely to be affected by discharges from oil and gas facilities. The effects discussed under biological resources above apply equally to threatened and endangered species. Furthermore, with respect to water quality, the FEIS for the Cook Inlet Planning Area sales concluded that the "[p]otential effects from either or both sales would not cause any overall measurable degradation to Cook Inlet water quality" (MMS, 2003). The FEIS concluded that any effects to threatened and endangered species would likely be due to "...noise and other disturbance caused by exploration, development, and production activities and disturbance from aircraft and vessels. For example, in specific areas, particularly near the Barren Islands, these disturbances could affect behavior of Steller sea lions and haulouts; cause local, short-term effects on the feeding of humpback whales in the Kennedy and Stevenson entrances; and locally affect some Cook Inlet beluga whales" (MMS 2003).

5.1.1.7 Socioeconomic Conditions

Long-term minor beneficial economic effects would be expected. Development and production of new lease sales 191 and 199 would generate economic activity primarily in property taxes,

employment, and personal income. These economic effects would be in the Kenai Peninsula Borough.

5.1.1.8 Land and Shoreline Use and Management

No effects would be expected.

5.1.1.9 Transportation and Infrastructure

No effects would be expected.

5.1.1.10 Recreation, Tourism, and Visual Resources

No effects would be expected.

5.1.1.11 Cultural, Historic, and Archaeological Resources

No effects would be expected.

5.1.1.12 Environmental Justice

No effects would be expected.

5.1.1.13 Cumulative Effects

No cumulative effects would be expected.

5.1.1.14 Mitigation

No mitigation measures would be required. The proposed NDPES general permit would contain water quality-based limits and monitoring requirements that are necessary to attain state water quality standards and federal criteria. Lessees must comply with all applicable local, state, and federal codes, statutes, and regulations. The implementation of these limitations and conditions would maintain the water quality of Cook Inlet and prevent unreasonable degradation of the marine environment.

5.1.2 Consequences of Alternative 2

The evaluation of Alternative 2 indicates that the physical and socioeconomic environment of Cook Inlet and the surrounding region would not be significantly affected. The predicted consequences on resource areas are briefly described below.

5.1.2.1 Geology

No effects would be expected.

5.1.2.2 Climate and Meteorology

No effects would be expected.

5.1.2.3 Oceanography

No effects would be expected.

5.1.2.4 Marine Water Quality

Long-term minor beneficial effects on marine water quality would be expected. Under Alternative 2, existing sources, along with new sources, would not be allowed to discharge produced water. Produced waters would have to be reinjected downhole during development and production. Zero discharge of produced waters through reinjection would reduce or eliminate the release of man-made contaminants from petroleum activities and any associated sedimentation and turbidity in Cook Inlet.

5.1.2.5 Biological Resources

Long-term minor adverse and beneficial effects could occur. Effects would be largely the same as those stated for Alternative 1 biological resources. Some improvement in water quality could result from the discontinuation of produced water discharges from existing sources in leased areas, though the water quality improvements would be minor and would be unlikely to be significantly beneficial to biological resources in Cook Inlet.

5.1.2.6 Threatened and Endangered Species

Long-term minor adverse and beneficial effects could occur. Effects would be largely the same as those stated above for biological resources. Some improvement in water quality could result from the discontinuation of produced water discharges from existing sources in leased areas, though it would be unlikely to be significantly beneficial to threatened and endangered species.

5.1.2.7 Socioeconomic Conditions

Long-term minor beneficial economic effects would be expected. Development and production of new lease sales 191 and 199 would generate economic activity primarily in property taxes, employment, and personal income. These economic effects would be in the Kenai Peninsula Borough.

5.1.2.8 Land and Shoreline Use and Management

No effects would be expected.

5.1.2.9 Transportation and Infrastructure

No effects would be expected.

5.1.2.10 Recreation, Tourism, and Visual Resources

No effects would be expected.

5.1.2.11 Cultural, Historic, and Archaeological Resources

No effects would be expected.

5.1.2.12 Environmental Justice

No effects would be expected.

5.1.2.13 Cumulative Effects

No cumulative effects would be expected.

5.1.2.14 Mitigation

No mitigation measures would be required. The proposed NDPES general permit would contain water-quality based limits and monitoring requirements which are necessary to attain state water quality standards and federal criteria. Lessees must comply with all applicable local, state, and federal codes, statutes, and regulations. The implementation of these limitations and conditions would maintain the water quality of Cook Inlet and prevent unreasonable degradation of the marine environment.

5.1.3 Consequences of Alternative 3

The evaluation of Alternative 3 indicates that the physical and socioeconomic environment of Cook Inlet and the surrounding region would not be significantly affected. The predicted consequences on resource areas are briefly described below.

5.1.3.1 Geology

No effects would be expected.

5.1.3.2 Climate and Meteorology

No effects would be expected.

5.1.3.3 Oceanography

No effects would be expected.

5.1.3.4 Marine Water Quality

Long-term minor adverse effects would be expected. Produced water discharges from existing sources are toxic to moderately toxic. Produced water discharges comprise the overwhelming majority of discharges by volume (relative to other oil and gas platform discharges). The water quality of lower Cook Inlet generally is good. The proposed NDPES permit would contain the limitations and conditions that are necessary to attain state water quality standards and federal criteria, maintain the water quality of Cook Inlet, and prevent unreasonable degradation of the marine environment.

5.1.3.5 Biological Resources

Long-term minor adverse effects on biological resources would be expected. Effects would be largely the same as those stated for Alternative 1 biological resources. The permitting of produced water discharges from new sources would not likely have an effect because it is not expected that production from new sources would occur during the life of the proposed general permit. If produced water discharges were to originate from new sources during the life of the permit, the effects on biological resources would be expected to be minor because all discharges would be required to comply with the state of Alaska water quality standards and federal ocean discharge criteria.

5.1.3.6 Threatened and Endangered Species

Long-term minor adverse effects would be expected. Effects would be largely the same as those stated for biological resources above. It is not expected that production would originate from new sources during the life of the proposed permit, and if produced water discharges were to occur from new sources, the effects on threatened and endangered species would be expected to be minor.

5.1.3.7 Socioeconomic Conditions

Long-term minor beneficial economic effects would be expected. Development and production of new lease sales 191 and 199 would generate economic activity primarily in property taxes, employment, and personal income. These economic effects would be in the Kenai Peninsula Borough.

5.1.3.8 Land and Shoreline Use and Management

No effects would be expected.

5.1.3.9 Transportation and Infrastructure

No effects would be expected.

5.1.3.10 Recreation, Tourism, and Visual Resources

No effects would be expected.

5.1.3.11 Cultural, Historic, and Archaeological Resources

No effects would be expected.

5.1.3.12 Environmental Justice

No effects would be expected.

5.1.3.13 Cumulative Effects

No cumulative effects would be expected.

5.1.3.14 Mitigation

No mitigation measures would be required. The proposed NDPES general permit would contain water quality-based limits and monitoring requirements that are necessary to attain state water quality standards and federal criteria. Lessees must comply with all applicable local, state, and federal codes, statutes, and regulations. The implementation of these limitations and conditions would maintain the water quality of Cook Inlet and prevent unreasonable degradation of the marine environment.

5.1.4 Consequences of No Action (Alternative 4)

The evaluation of the No Action (Alternative 4) indicates that the physical and socioeconomic environment of Cook Inlet and the surrounding region would not be significantly affected. The predicted consequences on resource areas are briefly described below.

5.1.4.1 Geology

No effects would be expected.

5.1.4.2 Climate and Meteorology

No effects would be expected.

5.1.4.3 Oceanography

No effects would be expected.

5.1.4.4 Marine Water Quality

No effects would be expected.

5.1.4.5 Biological Resources

No effects would be expected.

5.1.4.6 Threatened and Endangered Species

No effects would be expected.

5.1.4.7 Socioeconomic Conditions

No effects would be expected.

5.1.4.8 Land and Shoreline Use and Management

No effects would be expected.

5.1.4.9 Transportation and Infrastructure

No effects would be expected.

5.1.4.10 Recreation, Tourism, and Visual Resources

No effects would be expected.

5.1.4.11 Cultural, Historic, and Archaeological Resources

No effects would be expected.

5.1.4.12 Environmental Justice

No effects would be expected.

5.1.4.13 Cumulative Effects

No cumulative effects would be expected.

5.1.4.14 Mitigation

No mitigation measures would be required.

5.2 CONCLUSIONS

On the basis of the analysis performed in this EA, implementation of the proposed action (Alternative 1), would have no significant direct, indirect, or cumulative effects on the quality of the natural or human environment. Preparation of an Environmental Impact Statement is not

required. Issuance of a Finding of No Significant Impact would be appropriate. Table 5-1 provides a summary and comparison of the consequences of the four alternatives.

Table 5-1. Summary of Potential Environmental and Socioeconomic Consequences

Environmental and Socioeconomic Consequences				
Resource	**Proposed Action (Alternative 1)**	**Alternative 2**	**Alternative 3**	**No Action (Alternative 4)**
Geology	No effects	No effects	No effects	No effects
Climate and Meteorology	No effects	No effects	No effects	No effects
Oceanography	No effects	No effects	No effects	No effects
Marine Water Quality	Long-term minor adverse	Long-term minor beneficial	Long-term minor adverse	No effects
Biological Resources	Long-term minor adverse	Long-term minor adverse and beneficial	Long-term minor adverse	No effects
Threatened and Endangered Species	Long-term minor adverse	Long-term minor adverse and beneficial	Long-term minor adverse	No effects
Socioeconomic Conditions	Long-term minor beneficial	Long-term minor beneficial	Long-term minor beneficial	No effects
Land and Shoreline Use Management	No effects	No effects	No effects	No effects
Transportation and Infrastructure	No effects	No effects	No effects	No effects
Recreation, Tourism, and Visual Resources	No effects	No effects	No effects	No effects
Cultural, Historic, and Archaeological Resources	No effects	No effects	No effects	No effects
Environmental Justice	No effects	No effects	No effects	No effects

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SECTION 6.0: REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2003. *Statewide Summary of Oil and Hazardous Substance Spill Data (Fiscal Years 1996–2002)*. Provisional Report. Alaska Department of Environmental Conservation, Juneau, AK.

ADFG (Alaska Department of Fish and Game). 1986. *Distribution, Abundance, and Human Use of Fish and Wildlife–Alaska Habitat Management Guide, Southcentral Region*. Vol. 2. Alaska Department of Fish and Game, Habitat Division, Juneau, AK.

—. 2003. *2003 Upper Cook Inlet Commercial Salmon Fishery Season Summary*. Alaska Department of Fish and Game, Division of Commercial Fisheries. <http://www.cf.adfg.state.ak.us/region2/finfish/salmon/uci/ucipos03.php>.

—. 2003. *Short-tailed Albatross (Diomedia albatrus)*. Alaska Department of Fish and Game, Division of Wildlife Conservation. <http://www.wildlife.alaska.gov/aawildlife/endangered/albatros.cfm>.

—. 2004a. *Steelhead Trout*. <http://www.adfg.state.ak.us/pubs/notebook/fish/steelhd.php>.

—. 2004b. *Dolly Varden*. <http://www.adfg.state.ak.us/pubs/notebook/fish/dolly_v.php>.

—. 2004c. *Eulachon*. <http://www.adfg.state.ak.us/pubs/notebook/fish/eulachon.php>.

—. 2004d. *Pacific Herring*. <http://www.adfg.state.ak.us/pubs/notebook/fish/herring.php>.

—. 2004e. *Whitefish Species*. <http://www.adfg.state.ak.us/pubs/notebook/fish/whitfish.php>.

—. 2004f. *Pacific Halibut*. <http://www.adfg.state.ak.us/pubs/notebook/fish/halibut.php>.

—. 2004g. *Lingcod*. <http://www.adfg.state.ak.us/pubs/notebook/fish/lingcod.php>.

ADNR (Alaska Department of Natural Resources). 1999. *Cook Inlet Areawide 1999 Oil and Gas Lease Sale, Final Finding of the Director*. Alaska Department of Natural Resources, Division of Oil and Gas. January 20, 1999.

—. 2004. *Alaska Oil and Gas Report*. For the period ending December 31, 2003. Alaska Department of Natural Resources, Division of Oil and Gas, Anchorage, AK. December 2004.

Angliss, R.P., and A.L. Lodge. 2002. *Draft Alaska Marine Mammal Stock Assessments, 2002*. U.S. Department of Commerce, National Marine Fisheries Service, Seattle, WA.

ATSDR (Agency for Toxic Substances and Disease Registry). 2006. Health Consultation Evaluation of Biota Data Collected in the Vicinity of Tyonek, Seldovia, Port Graham, and Nanwalek, Alaska. Public Comment Release. U.S. Department of Health and Human Services, Public Health

Service, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation.

Becker, P.R., M.M. Krahn, E.A. Mackey, R. Demiralp, M.M. Schantz, M.S. Epstein, M.K. Donais, B.J. Porter, D.C.G. Muir, and S.A. Wise. 2000. Concentrations of polychlorinated biphenyls (PCBs), chlorinated pesticides, and heavy metals and other elements in tissues of Belugas, Delphinapterus leucas, from Cook Inlet, Alaska. *Marine Fisheries Review 62:81–98*.

Braham, H.W., and M.E. Dahlheim. 1982. Killer whales in Alaska documented in the Platforms of Opportunity Program. *Report of the International Whaling Commission 32:643–646*.

Braham, H.W. 1986. An annotated bibliography of right whales, Eubalaena glacialis, in the North Pacific. *Report of the International Whaling Commission. Special Issue 10:65–77*.

Calkins, D.G. 1983. *Marine mammals of lower Cook Inlet and the potential for impact from outer continental shelf oil and gas exploration, development, and transport*. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. OCSEAP Final Report 20:171–265.

Cook Inlet Keeper. 2005. *Cook Inlet Keeper Analysis Shows Favorable Oil Pipeline Spill Trends Offshore Oil and Oil/Gas Field Pipeline Releases Continue, However*. <http://www.inletkeeper.org/new%20pipelines%20pages/51115press.pdf>. Accessed December 12, 2005.

Carretta, J.V., M.M. Muto, J. Barlow, J. Baker, K.A. Forney, and M. Lowry. 2002. *U.S. Pacific Marine Mammal Stock Assessments: 2002*. NOAA-TM-NMFS-SWFSC-346. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, La Jolla, CA. 286 pp. <http://www.nmfs.noaa.gov/prot_res/readingrm/MMSARS/2002PacificSARs.pdf>.

Cramer, S.P. 1990. *The Feasibility for Reintroducing Sockeye and Coho Salmon in the Grande Ronde River and Coho and Chum Salmon in the Walla Walla River*. Progress Report prepared for Nez Perce Tribe, Umatilla Confederated Tribes, Warm Springs Confederated Tribes, and Oregon Department of Fish and Wildlife by S. P. Cramer and Associates, Gresham, Oregon.

Dahlheim, M.E., and J. Waite. 1992. *Abundance and Distribution of Killer Whales in Alaska 1992*. Draft report. U.S. Department of Commerce, National Marine Fisheries Service, Seattle, WA.

DCED (Department of Community and Economic Development). 2004. Community Database Online. < http://www.dced.state.ak.us/dca/commdb/CF_BLOCK.cfm>.

Ferrero, R.C., D.P. DeMaster, P.S. Hill, M.M. Muto, and A.L. Lopez. 2000. *Alaska Marine Stock Assessments, 2000*. NOAA Technical Memorandum NMFS-AFCS-119. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle, WA. 195 pp. <http://www.nmfs.noaa.gov/prot_res/readingrm/MMSARS/2000AlaskaSARs.pdf>.

Fish Passage Center (FPC). 2003. *Fish Passage Center Annual Report - 2002.* Fish Passage Center, Columbia River Basin Fish and Wildlife Authority, Portland, OR.

Gaskin, D.E. 1984. The harbor porpoise (Phocoena phocoena) (L.): Regional populations, status, and information on direct and indirect catches. *Report of the International Whaling Commission. 34:569–586*.

Healy, M.C. 1991. Life history of Chinook salmon. In: C. Groot and L. Margolis (Eds.). *Pacific Salmon Life Histories*. UBC Press, Vancouver, B.C., Canada.

Hoover, A.A. 1988. Steller sea lions. Eumetopias jubatus. In *Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations, ed. J.W. Lentfar, pp. 159–193*. Marine Mammal Commission, Washington, DC.

IPHC (International Pacific Halibut Commission). 1998. *The Pacific Halibut: Biology, Fishery, and Management*. Technical Report No. 40. International Pacific Halibut Commission.

Irving, J.S., and T.C. Bjornn. 1981. Status of Snake River Fall Chinook Salmon in Relation to the Endangered Species Act. Prepared for U.S. Fish and Wildlife Service, by Idaho Cooperative Fishery Research Unit, University of Idaho, Moscow, ID.

McClure, M., B. Sanderson, E. Holmes, C. Jordan, P. Kareiva, and P. Levin. 2000. *Revised Appendix B of Standardized Quantitative Analysis of the Risks Faced by Salmonids in the Columbia River Basin*. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

Merrick, D.C., M.K. Chumbley, and G.V. Byrd. 1997. Diet and diversity of Steller sea lions (Eumetopias jubatus) and their population decline in Alaska: A potential relationship. *Canadian Journal of Fisheries and Aquatic Sciences 54:1342–1348*.

Morrow, J.E. 1980. *The Freshwater Fishes of Alaska*. Alaska Northwest Pub. Co., Anchorage, AK.

MMS (Minerals Management Service). 1995. *Alaska Outer Continental Shelf Cook Inlet Planning Area Oil and Gas Lease Sale 149*. Draft Environmental Impact Statement. OCS EIS/EA MMS 94-0066. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf, Anchorage, AK.

—. 2003. *Cook Inlet Planning Area. Oil and Gas Lease Sales 191 and 199*. Final Environmental Impact Statement. OCS EIS/EA MMS 94-0066. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf, Anchorage, AK.

NMFS (National Marine Fisheries Service). 1991. *Recovery Plan for the Humpback Whale (Megaptera novaeanangliae)*. Prepared by the Humpback Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 pp.

—. 1992. *Recovery Plan for the Humpback Whale (Megaptera novaeangliae)*. Prepared by the Humpback Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 pp.

—. 1992. *Recovery Plan for the Steller Sea Lion (Eumetopias jubatus)*. Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 92 pp.

—. 1993. Designated Critical Habitat; Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, and Snake River Fall Chinook Salmon. December 28, 1993, Federal Register 58: 68543-68554.

—. 1995. *Proposed Recovery Plan for Snake River Salmon*. NMFS, Protected Resources Division, Portland, Oregon.

—. 1998a. Endangered and Threatened Species: Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs; Proposed Redefinition, Threatened Status, and Revision of Critical Habitat for One Chinook Salmon ESU; Proposed Designation of Chinook Salmon Critical Habitat in California, Oregon, Washington, Idaho. March 9, 1998, Federal Register 63: 11482-11520.

—. 1998b. *Stock Assessment Report: Sperm Whale (Physeter macrocephalus)—North Pacific Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/ prot_res/PR2/Stock_Assessment_Program/ individual_sars.html#cetaceans>.

—. 2000. *Stock Assessment Report: Sei Whale (Balaenoptera borealis)—Eastern North Pacific Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/ prot_res/PR2/Stock_Assessment_Program/ individual_sars.html#cetaceans>.

—. 2001a. *Stock Assessment Report: Fin Whale (Balaenoptera physalis)—Northeast Pacific Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/ prot_res/PR2/Stock_Assessment_Program/individual_sars.html#cetaceans>.

—. 2001b. *Stock Assessment Report: Humpback Whale (Megaptera novaeagliae)—Central Northeast Pacific Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/individual_sars.html#cetaceans>.

—. 2002a. *Stock Assessment Report: North Pacific Right Whale (Eubalaena japonica)—Eastern North Pacific Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/individual_sars.html#cetaceans>.

—. 2002b. *Stock Assessment Report: Bowhead Whale (Balaena mysticetus)—Western Arctic Stock*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources, Silver Spring, MD. <http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/individual_sars.html#cetaceans>.

NatureServe. 2003. *Comprehensive report: Phoebastria albatrus (Pallas, 1769): Short-tailed albatross*. NatureServe Explorer: An Online Encyclopedia of Life. Ver. 1.8. NatureServe, Arlington, VA. <http://www.natureserve.org/explorer/servlet/NatureServe?searchName= Phoebastria+albatrus>.

Perry, S.L., D.P. Demaster, and G.K. Silber. 1999a. The right whales. *Marine Fisheries Review 61(1):7–23*.

—, —, —. 1999b. The humpback whale. *Marine Fisheries Review 61(1):24–37*.

Reeves, R.R., G.K. Silber, and P.M. Payne. 1998a. *Draft Recovery Plan for the Fin Whale Balaenoptera physalus and Sei Whale Balaenoptera borealis*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. Silver Spring, MD. <http://www.cresli.org/cresli/pdf%20documents/finwhale.pdf>.

Reeves, R.R., P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber. 1998b. *Recovery Plan for the Blue Whale (Balaenoptera musculus)*. National Marine Fisheries Service, National Oceanic Atmospheric Administration, Office of Protected Resources. Silver Spring, MD. 39 pp.

Ruccio, M.P., and D.R. Jackson. 2002. *Red Sea Cucumber and Green Sea Urchin Commercial Fisheries Management Plans for the Registration Area J (Westward Region), 2002/03*. Regional Information Report No. 4K02-44. Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak, AK.

SAIC (Science Applications International Corporation). 2002. *Environmental Assessment for the New Source NPDES Forest Oil Redoubt Shoal Unit Production Oil and Gas Development Project*. Prepared for U.S. Environmental Protection Agency, Region 10, Office of Water, NPDES Permits Unit. Project No. 01-0817-01-9695-00.

Small, R.J. 2001. Executive Summary. In Harbor Seal Investigations in *Alaska, Annual Report*, pp. i-xiii. Alaska Department of Fish and Game, Anchorage, AK.

Tetra Tech, Inc. (Tetra Tech). 2005. Draft Biological Evaluation for the Cook Inlet NPDES Permit. Prepared for U.S. Environmental Protection Agency Region 10, Office of Water, NPDES Permits Unit, Seattle, WA, by Tetra Tech, Inc., Lakewood, CO.

USACE (U.S. Army Corps of Engineers). 2003. *Natural Resource Management Section Adult Fish Counts: 2003 YTD Running Sums for Adult Fish Counts-Lower Granite*. <https://www.nwp.usace.army.mil/op/fishdata/runsum2003.htm> Accessed_____.

USACE (U.S. Army Corps of Engineers). 1993. *Deep Draft Navigation Report, Cook Inlet, Alaska*. U.S. Army Corps of Engineers, Alaska District.

USEPA (U.S. Environmental Protection Agency). 1999. *Authorization to Discharge under the National Pollutant Discharge Elimination System for Oil and Gas Exploration, Development, and Production Facilities*. Permit No. AKG285000 Cook Inlet. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

—. 2002. *Biological Assessment of the Alaska Water Quality Standards for the U.S. Fish and Wildlife Service and National Marine Fisheries Service*. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

—. 2003. *Survey of Chemical Contaminants in Fish, Invertebrates and Plants Collected in the Vicinity of Tyonek, Seldovia, Port Graham and Nanwalek—Cook Inlet, AK*. EPA 910-R-01-003. U.S. Environmental Protection Agency, Region 10, Office of Environmental Assessment, Seattle, WA. 48 pp. + appendices.

USFWS (U.S. Fish and Wildlife Service). 2000. *Steller's Eider (Polysticta stelleri) fact sheet*. <http//www/r7/fws.gov/media/StellEider_FactSheet.htm>.

—. 2002a. *Steller's Eider Recovery Plan*. U.S. Fish and Wildlife Service, Fairbanks, AK.

—. 2002b. *Sea otter (Enhydra lutris): Southwest Alaska Stock. Marine Mammal Stock Assessment Report*. Revised Aug. 20, 2002. U.S. Fish and Wildlife Service, Fairbanks, AK. 7 pp.

—. 2005. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter (*Enhydra lyutris kenyoni*). August 9, 2005, *Federal Register* 70: 46366-46386.

Waples, R.S., R.P. Jones, Jr., B.R. Beckman, and G.A. Swan. 1991. *Status Review for Snake River Fall Chinook Salmon*. U.S. Department of Commerce, NOAA Tech. Memo. NMFS F/NWC-201.

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AMSA	Area Meriting Special Attention
$BaSO_4$	barium sulfate
BAT	best available pollution control technology economically achievable
bcf	billion cubic feet
BCT	best conventional pollution control technology
BOD	biochemical oxygen demand
BP	Before Present
BPT	best practicable control technology
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHA	critical habitat area
CO	carbon monoxide
COST	Continental Offshore Stratigraphic Test
CWA	Clean Water Act
DPS	distinct population segment
EA	environmental assessment
EFH	essential fish habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	final environmental impact statement
FNSI	finding of no significant impact
FR	Federal Register
gpd	gallons per day
GC/MS	Chromatography/Mass Spectrometry
H_2S	hydrogen sulfide
HPC	habitat areas of particular concern
LNG	liquid natural gas
mg/L	milligrams per liter
MLLW	mean lower low water
MMS	Minerals Management Service
MSA	Magnuson-Stevens Act
MSD	marine sanitation device
NAAQS	National Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NORM	naturally occurring radioactive materials
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
O_3	ozone
OCDD	octachlorodibenzo-p-dioxin
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofurans

PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of less than or equal to 10 microns
ppb	parts per billion
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
SGR	state game refuge
SGS	state game sanctuary
SOx	sulfur oxides
SO_2	sulfur dioxide
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TEK	traditional ecological knowledge
TSP	total suspended particulate matter
TSS	total suspended solids
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WET	Whole Effluent Toxicity
WQBELS	water quality-based effluent limitations